REMARKS

Claims 1-18 are currently pending. Claim 8 has been amended herein. New claims 16-18 have been added herein. Reconsideration of the above-identified application is respectfully requested.

The Office Action includes a rejection of Claim 8 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Claim 8 has been amended as suggested by the Examiner. The claim change is not intended to narrow the scope of Claim 8. Withdrawal of the rejection is respectfully requested.

The Office Action includes a rejection of Claims 1, 2, 4, 6-8, and 10-14 under 35 U.S.C. § 103(a) as allegedly being unpatentable over the Fukushima et al. publication (JP 62-200320) in view of the Kimura et al. patent (U.S. Patent No. 5,590,942). This rejection is respectfully traversed.

The Office alleges that the Fukushima et al. publication discloses a polarization conversion optical system for converting light having a nonuniform plane of polarization to light having a uniform plane of polarization having the features recited in independent Claims 1, 6, and 10, except for a quarter-wavelength plate. In this regard, the Office acknowledges that the feature 16 disclosed in the Fukushima et al. publication is a half-wavelength plate, not a quarter-wavelength plate. The Office further alleges that the Kimura et al. patent discloses a quarter-wavelength plate (feature 521 in Figure 7 therein) and that it would have been obvious to one of ordinary skill in the art to modify the Fukushima et al. system by replacing the half-wavelength plate 16 with the quarter-wavelength plate 521 disclosed in the Kimura et al. patent. The Office's suggested purpose for the modification is to produce a uniform plane of polarization.

Applicants respectfully submit that the rejection does not make out a *prima facie* case of obviousness. First, Applicants respectfully submit that the rejection does not provide proper motivation for modifying the Fukushima et al. system inasmuch as the rejection purports to modify the Fukushima et al. system for a purpose that is alleged in the rejection to already be achieved by that system. In particular, the Office alleges in paragraph three of the Office Action that the Fukushima et al. publication discloses a polarization conversion optical system for converting light having a nonuniform plane of

polarization to light *having a uniform plane of polarization*. (Applicants disagree with this assertion, as discussed below.) The Office then suggests that one of ordinary skill in the art would have been motivated to modify the Fukushima et al. system *to provide a uniform plane of polarization*. In other words, the rejection purports to modify the Fukushima et al. system for a purpose that is alleged in the rejection to already be achieved by that system. Accordingly, the rejection does not provide proper motivation for the suggested modification at least because of this deficiency. Withdrawal of the rejection and allowance of Claims 1, 2, 4, 6-8, and 10-14 are respectfully requested for at least this reason.

In fact, the Fukushima et al. publication does not disclose a polarization conversion optical system for providing light having a uniform plane of polarization, and Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to make the Office's suggested modification at least because doing so would render the Fukushima et al. system unsuitable for its intended purpose. Contrary to the Office's suggestion, the Fukushima et al. publication does not disclose a polarization conversion optical system that converts light having a non-uniform plane of polarization into light having a uniform plane of polarization. Rather, the Fukushima et al. publication discloses a diffraction-grating-type optical demultiplexer that maintains separate S- and P-polarization components at its output. This is evident from Figure 1 of the Fukushima et al. publication. In particular, the incident P-polarization component of light incident along line "a" is transmitted through the polarization separating film 15, is reflected at the diffraction grating 11, and is transmitted back through the polarization separating film along the dotted line "d", emerging from the optical system 10 as P-polarized light. In addition, the S-polarization component of light incident along line "a" undergoes a variety of reflections, and passes through the half-wave plate twice, thus being converted from S-polarized light to P-polarized light and back to S-polarized light, thereby emerging from the optical system 10 as S-polarized light. The optical system 10 is understood to separate light into a P-polarization component and an S-polarization component and then convert the S-polarization component to P-polarized light before reflection at the diffraction grating for the purpose of removing an influence of polarization dependency of diffraction efficiency at the diffraction grating 11. Such a polarization dependency would otherwise increase the

insertion loss in the optical demultiplexer 10 (optical system 10), which receives a light from a fiber-optic cable 2 and outputs a light to the fiber-optic cable 2 (see, e.g., Figure 3).

To operate as an optical demultiplexer, the optical system 10 illustrated in Figure 1 of the Fukushima et al. publication is evidently intended to maintain separate S- and P-polarization components at its output. Accordingly, if the optical system 10 disclosed in the Fukushima et al. publication were hypothetically modified as suggested by the Office, the modification would render the Fukushima et al. system 10 unsuitable for its intended purpose as an optical demultiplexer because it would no longer maintain separate S- and P-polarization components at its output. Rather, the optical system 10, hypothetically modified as suggested by the Office, would provide light at its output having only a P-polarization component. Accordingly, the Office's suggested modification would render the Fukushima et al. system unsuitable for its intended purpose, and one of ordinary skill in the art would not have been motivated to make such a modification for at least this reason.

Applicants also respectfully submit that there is no suggestion in the Fukushima et al. publication of using a reflecting element, and a multilayer film having the incidence angle depending for first and second polarized light at first and second incidence angles, as recited in Claim 1. Independent Claim 1 recites a polarization conversion optical system for converting light having a nonuniform plane of polarization to light having a uniform plane of polarization. The polarization conversion optical system comprises, *inter alia*, a dielectric multilayer film having a different incidence angle dependency relative to a first polarized light component and a second polarized light component which have mutually intersecting planes of polarization, so as to transmit the first polarized light component and reflect the second polarized light component at a first incidence angle, and transmit the second polarized light component at a second incidence angle. The polarization conversion optical system also comprises a reflecting element for reflecting light entering the dielectric multilayer film at the first incidence angle and transmitted through the dielectric multilayer film so as to impinge the dielectric multilayer film at the second incidence angle.

For example, as discussed at page 11, line 14 - page 12, line 2 of the present application, the polarization conversion element 1 illustrated in Figure 1 can receive

incident light having both S- and P-polarization components at an incidence angle A (such as shown in Figure 2) relative to a dielectric multilayer film 11 that has a reflectance/transmittance behavior for S-polarized and P-polarized light as a function of incidence angle as shown in Figure 2. The angle A is within a range of angles that provides high transmittance for P-polarized light and high reflectance for S-polarized light. Thus, incident S-polarized light is reflected at the dielectric multilayer film 11, and incident P-polarized light is transmitted through the dielectric multilayer film 11. In the example of Figures 1 and 2, the P-polarized light travels through a substrate 14 and a quarter-wave plate 13, and is diffracted by a diffraction grating 12 back through the substrate 14 and the quarter-wave plate 13. By traveling through the quarter-wave plate 13 twice, the light that was originally transmitted through the dielectric multilayer film 11 as P-polarized light is converted to S-polarized light. Moreover, the diffraction conditions are set so that the light diffracted from the diffraction grating 12 impinges on the dielectric multilayer film 11 at an angle B different from angle A (such as shown in Figure 2) such that this diffracted light, now S-polarized, is transmitted through the film 11. By directing incident light to the multilayer film 11 at a *first incidence angle* A, an S-polarized component of the incident light can be *reflected* at the multilayer film 11, and by directing diffracted light, now converted to S-polarization, back to the multilayer film 11 at a *second incidence angle* B, the converted S-polarized light can be *transmitted* through the multilayer film 11. Thus, incident light having both S- and P-polarization components can be transformed to emerge from the polarization conversion element 1 as light having one polarization component (S-polarization in the example of Figures 1 and 2), thereby providing light with a uniform plane of polarization. Of course, the claims are not limited to the example of Figures 1 and 2.

In contrast, the Fukushima et al. publication does not disclose or suggest a dielectric multilayer film and a reflecting element arranged as recited in Claim 1. It is evident from Figure 1 of the Fukushima et al. publication that incident light having S and P polarization components impinges upon the polarization separating film 15, wherein the P polarization component is transmitted through the polarization separating film 15 and wherein the S polarization component is reflected from the film 15. The S-polarization component then

passes through the half-wave plate 16, is reflected from the diffraction grating 11 back through the half-wave plate 16, is reflected from an outer surface of the transparent body 13, and is finally reflected again from the polarization separating film 15 before exiting the demultiplexer 10. The P-polarization component is reflected at the diffraction grating 11 and is transmitted back through the polarization separating film 15. Thus, the Fukushima et al. publication discloses that P-polarized light is *transmitted* through the polarization separating film both before and after reflection at the diffraction grating 11, and discloses that S-polarized light is *reflected* from the polarization separating film both before and after reflection at the diffraction grating 11. There is no disclosure in the Fukushima et al. publication of *reflecting* S-polarized light from the polarization separating film 15 at a first incidence angle and *transmitting* S-polarized light through the polarization separating film 15 at a second incidence angle. For at least this reason, the Fukushima et al. publication does not disclose or suggest that the polarization separating film 15 transmits light of a second polarized light component (the S polarization component as applied to Figure 1 therein) at a second incidence angle in the manner recited in Claim 1. Similar arguments apply for independent Claims 6 and 10.

Further, even if, for the sake of argument, the Office's suggested modification were made, the resulting hypothetical apparatus would not possess the features recited in independent Claims 1, 6 and 10. In particular, the Office alleges that the S-polarization component illustrated in Figure 1 of the Fukushima et al. patent corresponds to the second polarized light component recited in Claim 1. The Office states that the S-polarization component is reflected at a first incidence angle and is then transmitted (however negligibly) through the polarization separating film 15 at a second incidence angle, referring to Figure 1 therein. However, if the Office's hypothetical modification were made, the S-polarization component would be transformed to a P-polarization component after passing twice through the substituted quarter-wave plate. Accordingly, the resulting hypothetical apparatus would not "transmit the second polarized light component at a second incidence angle" as claimed at least because, under the Office's suggested modification, the S-polarization component would no longer exist after passing twice through the substituted quarter-wave plate, such light having been converted to P-

polarization. Accordingly, even if the Office's suggested modification were made, the resulting hypothetical apparatus would not possess the features recited in Claim 1. Similar arguments apply for independent Claims 6 and 10.

Accordingly, withdrawal of the rejection and allowance of independent Claims 1, 6, and 10 are respectfully requested for at least the above-noted reasons. Claims 2-5, 7-9, and 11-15 are allowable at least by virtue of dependency.

In addition, Applicants respectfully submit that none of the cited references disclose a dielectric multilayer film that transmits a first polarized light component and reflects a second polarized light component at a first incidence angle, and that transmits the second polarized light component at a second incidence angle, as recited in independent Claims 1 and 6, and as recited using similar language in Claim 10. Claims 1-15 are allowable for at least this additional reason.

The Office Action includes a rejection of Claim 3 under 35 U.S.C. § 103(a) as allegedly being unpatentable over the Fukushima et al. publication in view of the Kimura et al. patent, and further in view of the Wentz patent (U.S. Patent No. 4,515,441) and a rejection of Claims 5, 9, and 15 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Fukushima et al. publication in view of the Kimura et al. patent, and further in view of the Steiner et al. patent (EP 0471109). Applicants respectfully submit that Claims 3, 5, 9, and 15 are allowable at least by virtue of dependency. Moreover, neither the Wentz patent nor the Steiner et al. patent make up for the deficiencies of the Fukushima et al. publication and the Kimura et al. patent as set forth above. Accordingly, withdrawal of the rejection and allowance of these claims are respectfully requested.

New dependent Claims 16-18, which depend from Claims 1, 6 and 10, respectively, have been added herein to round out the scope of protection sought. Claims 16-18 recite that, for incident light impinging on the dielectric multilayer film at the first incidence angle and comprising light having a first polarization direction and light having a second polarization direction, light of the first polarization direction incident on the dielectric multilayer film at the first incidence angle is transmitted through the dielectric multilayer film, light of the second polarization direction incident on the dielectric multilayer film at the first incidence angle is reflected from the dielectric multilayer film, the transmitted light

of the first polarization direction is reflected at the reflecting element (or the reflecting-type diffraction element in Claim 6, or the reflector in Claim 10) and is converted to converted light having the second polarization direction, and the converted light having the second polarization direction is transmitted through the dielectric multilayer film at the second incidence angle, such that the reflected light of the second polarization direction and the converted light having the second polarization direction emerge from a same side of dielectric multilayer film. Support may be found at least in Figures 1 and 5-9 of the present application, and in associated portions of the Description. Of course, the claims are not limited to the examples of Figures 1 and 5-9.

Claims 16-18 are patentable over the cited references at least for reasons similar to those set forth above for Claim 1. Moreover, these claims are additionally patentable at least because they recite that the reflected light of the second polarization direction and the converted light having the second polarization direction emerge from a *same side* of dielectric multilayer film. In contrast, even if, for the sake of argument, the disclosures of the Fukushima et al. publication and the Kimura et al. patent were combined as suggested by the Office, the resulting hypothetical apparatus would not provide a feature wherein reflected light of the second polarization direction and converted light having the second polarization direction emerge from a *same side* of dielectric multilayer film, as recited in Claim 16. Rather, under the Office's construction, light of the S-polarization component would not only be converted to P-polarization as discussed above, but such converted light would also emerge from an *opposite side* of the polarization separating film 15 than the reflected light of the S-polarization component. Claims 16-18 are patentable over the cited references for at least this additional reason.

In light of the foregoing, withdrawal of the rejections of record and allowance of this application are respectfully requested. Should there be any questions in connection with this application, the Office is invited to contact the undersigned at the number below.

Respectfully submitted,
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Date: January 20, 2004

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